

WHAT IS CLAIMED:

1. A semiconductor device comprising:
a first substrate;
a second substrate; and
a plurality of columnar spacers disposed between said first substrate and said second substrate, each of said columnar spacers having at least an upper surface, a side surface, and an edge between said upper surface and said side surface, wherein said upper surface faces a surface of said second substrate, and
an alignment film which covers said columnar spacers
wherein a radius R of curvature of said edge is 2 μm or less.
2. A semiconductor device according to claim 1, wherein each of said columnar spacers comprises a flat surface at said upper surface.
3. A semiconductor device according to claim 1, wherein a sectional shape of each of said columnar spacers in a radial direction is one selected from said group consisting of a circle, an ellipse, a triangle, a quadrilateral, and a polygon having sides more than said former.
4. A semiconductor device according to claim 1, wherein each of said columnar spacers comprises an insulating material.
5. A semiconductor device according to claim 1, wherein each of said columnar spacers is formed over a contact portion where a thin film transistor and a pixel electrode are connected to each other.
6. A semiconductor device according to claim 1, wherein said columnar spacers are formed only at a sealing region.

7. A semiconductor device according to claim 1, wherein said columnar spacers are formed at a sealing region and a pixel portion.

8. A semiconductor device according to claim 1, wherein said columnar spacers are formed at a sealing region and a region between a driver circuit and a pixel portion.

9. A semiconductor device according to claim 1, wherein said columnar spacers are formed at a region between a driver circuit and a pixel portion and at said pixel portion.

10. A semiconductor device according to claim 1, wherein said columnar spacers are formed at a region between a sealing region and a pixel portion.

11. A semiconductor device according to claim 1, wherein said columnar spacers are formed at a region between a sealing region and a driver circuit.

12. A semiconductor device according to claim 1, wherein said columnar spacers are formed at a region between a sealing region and an end portion of said substrate.

13. A semiconductor device according to claim 1, wherein said columnar spacers are formed at all regions of said substrate.

14. A semiconductor device according to claim 1, wherein said columnar spacers are covered with an alignment film, and a pretilt angle of a liquid crystal is 6° to 10°.

15. A semiconductor device according to claim 1, wherein said semiconductor device is an active matrix type liquid crystal display device.

16. A semiconductor device according to claim 1, wherein said semiconductor device

is at least one selected from the group consisting of a video camera, a digital camera, a projector, a goggle type display, a car navigation system, a personal computer, and a portable information terminal.

17. A semiconductor device according to claim 1, wherein a height of said columnar spacer is 10 μm or less.

18. A semiconductor device according to claim 1, wherein a width of said columnar spacer is 20 μm or less.

19. A semiconductor device according to claim 1, wherein an angle between a tangent plane at a center of a side of said columnar spacer and a substrate surface is 65° to 115° .

20. A semiconductor device according to claim 1, wherein a height of said columnar spacer is 10 μm or less, and a width of said columnar spacer is 20 μm or less.

21. A semiconductor device according to claim 1, wherein a height of said columnar spacer is 10 μm or less, and an angle between a tangent plane at a center of a side of said columnar spacer and a substrate surface is 65° to 115° .

22. A semiconductor device according to claim 1, wherein a width of said columnar spacer is 20 μm or less, and an angle between a tangent plane at a center of a side of said columnar spacer and a substrate surface is 65° to 115° .

23. A semiconductor device comprising:

a first substrate;

a second substrate;

a plurality of columnar spacers disposed between said first substrate and said

second substrate, each of said columnar spacers having at least an upper surface, a side surface, and an edge between said upper surface and said side surface, wherein said upper surface faces a surface of said second substrate, and

an alignment film below said columnar spacers,

wherein a radius R of curvature of said edge is 2 μm or less.

24. A semiconductor device according to claim 23, wherein each of said columnar spacers comprises a flat surface at said upper surface.

25. A semiconductor device according to claim 23, wherein a sectional shape of each of said columnar spacers in a radial direction is one selected from said group consisting of a circle, an ellipse, a triangle, a quadrilateral, and a polygon having sides more than said former.

26. A semiconductor device according to claim 23, wherein each of said columnar spacers comprises an insulating material.

27. A semiconductor device according to claim 23, wherein each of said columnar spacers is formed over a contact portion where a thin film transistor and a pixel electrode are connected to each other.

28. A semiconductor device according to claim 23, wherein said columnar spacers are formed only at a sealing region.

29. A semiconductor device according to claim 23, wherein said columnar spacers are formed at a sealing region and a pixel portion.

30. A semiconductor device according to claim 23, wherein said columnar spacers are formed at a sealing region and a region between a driver circuit and a pixel portion.

31. A semiconductor device according to claim 23, wherein said columnar spacers are formed at a region between a driver circuit and a pixel portion and at said pixel portion.

32. A semiconductor device according to claim 23, wherein said columnar spacers are formed at a region between a sealing region and a pixel portion.

33. A semiconductor device according to claim 23, wherein said columnar spacers are formed at a region between a sealing region and a driver circuit.

34. A semiconductor device according to claim 23, wherein said columnar spacers are formed at a region between a sealing region and an end portion of said substrate.

35. A semiconductor device according to claim 23, wherein said columnar spacers are formed at all regions of said substrate.

36. A semiconductor device according to claim 23, wherein said columnar spacers are covered with an alignment film, and a pretilt angle of a liquid crystal is 6° to 10°.

37. A semiconductor device according to claim 23, wherein said semiconductor device is an active matrix type liquid crystal display device.

38. A semiconductor device according to claim 23, wherein said semiconductor device is at least one selected from the group consisting of a video camera, a digital camera, a projector, a goggle type display, a car navigation system, a personal computer, and a portable information terminal.

39. A semiconductor device according to claim 23, wherein a height of said

columnar spacer is 10 μm or less.

40. A semiconductor device according to claim 23, wherein a width of said columnar spacer is 20 μm or less.

41. A semiconductor device according to claim 23, wherein an angle between a tangent plane at a center of a side of said columnar spacer and a substrate surface is 65° to 115° .

42. A semiconductor device according to claim 23, wherein a height of said columnar spacer is 10 μm or less, and a width of said columnar spacer is 20 μm or less.

43. A semiconductor device according to claim 23, wherein a height of said columnar spacer is 10 μm or less, and an angle between a tangent plane at a center of a side of said columnar spacer and a substrate surface is 65° to 115° .

44. A semiconductor device according to claim 23, wherein a width of said columnar spacer is 20 μm or less, and an angle between a tangent plane at a center of a side of said columnar spacer and a substrate surface is 65° to 115° .

45. A method of fabricating a semiconductor device comprising:
forming a thin film transistor over a substrate;
forming a leveling film to cover said thin film transistor;
forming an opening in said leveling film to reach to said thin film transistor and forming a pixel electrode;
forming a columnar spacer comprising an insulating film over a contact portion where said thin film transistor is connected to said pixel electrode.

46. A method of fabricating a semiconductor device according to claim 45, wherein

said step of forming said columnar spacer comprising said insulating film includes a step of forming said insulating film and a step of patterning said insulating film so that said columnar spacer is formed.

47. A method of fabricating a semiconductor device according to claim 45, wherein said semiconductor device is an active matrix liquid crystal display device.

48. A semiconductor device according to claim 45 wherein said semiconductor device is an EL display device.

49. A method of fabricating a semiconductor device according to claim 45, wherein said semiconductor device is at least one selected from the group consisting of a video camera, a digital camera, a projector, a goggle type display, a car navigation system, a personal computer, and a portable information terminal.

50. A semiconductor device comprising:
a thin film transistor over a first substrate;
a pixel electrode electrically connected to said thin film transistor;
an alignment film over the pixel electrode;
a columnar spacer over said alignment film, said columnar spacer having at least an upper surface, a side surface, and an edge between said upper surface and said side surface, wherein said upper surface faces a surface of said second substrate and a radius R of curvature of said edge is 2 μm or less; and
a light-shielding film provided over said second substrate,
wherein said columnar spacer is located below said light-shielding film.

51. A semiconductor device according to claim 50 wherein said columnar spacer has a flat surface at said upper surface.

52. A semiconductor device according to claim 50 wherein said columnar spacer comprises an insulating material.

53. A semiconductor device according to claim 50 wherein said semiconductor device is an active matrix type liquid crystal display device.

54. A semiconductor device according to claim 50 wherein said semiconductor device is at least one selected from the group consisting of a video camera, a digital camera, a projector, a goggle type display, a car navigation system, a personal computer, and a portable information terminal.

55. A semiconductor device comprising:
a thin film transistor over a first substrate;
a pixel electrode electrically connected to said thin film transistor in a contact hole;
an alignment film over said pixel electrode;
a columnar spacer on said contact hole, said columnar spacer having at least an upper surface, a side surface, and an edge between said upper surface and said side surface, wherein said upper surface faces a surface of said second substrate and a radius R of curvature of said edge is 2 μm or less; and
a light-shielding film provided over said second substrate,
wherein said columnar spacer is located below said light-shielding film.

56. A semiconductor device according to claim 55 wherein said columnar spacer has a flat surface at said upper surface.

57. A semiconductor device according to claim 55 wherein said columnar spacer

comprises an insulating material.

58. A semiconductor device according to claim 55 wherein said semiconductor device is an active matrix type liquid crystal display device.

59. A semiconductor device according to claim 55 wherein said semiconductor device is at least one selected from the group consisting of a video camera, a digital camera, a projector, a goggle type display, a car navigation system, a personal computer, and a portable information terminal.

60. A semiconductor device comprising:
a thin film transistor over a first substrate;
a pixel electrode electrically connected to said thin film transistor;
a columnar spacer over said first substrate, said columnar spacer having at least an upper surface, a side surface, and an edge between said upper surface and said side surface, wherein said upper surface faces a surface of said second substrate and a radius R of curvature of said edge is 2 μm or less;
an alignment film which covers said columnar spacer; and
a light-shielding film provided over said second substrate,
wherein said columnar spacer is located below said light-shielding film.

61. A semiconductor device according to claim 60 wherein said columnar spacer has a flat surface at said upper surface.

62. A semiconductor device according to claim 60 wherein said columnar spacer comprises an insulating material.

63. A semiconductor device according to claim 60 wherein said semiconductor

device is an active matrix type liquid crystal display device.

64. A semiconductor device according to claim 60 wherein said semiconductor device is at least one selected from the group consisting of a video camera, a digital camera, a projector, a goggle type display, a car navigation system, a personal computer, and a portable information terminal.

65. A semiconductor device comprising:
a thin film transistor over a first substrate;
a pixel electrode electrically connected to said thin film transistor in a contact hole;
a columnar spacer on said contact hole, said columnar spacer having at least an upper surface, a side surface, and an edge between said upper surface and said side surface, wherein said upper surface faces a surface of said second substrate and a radius R of curvature of said edge is 2 μm or less;
an alignment film which covers said columnar spacer; and
a light-shielding film provided over said second substrate,
wherein said columnar spacer is located below said light-shielding film.

66. A semiconductor device according to claim 65 wherein said columnar spacer has a flat surface at said upper surface.

67. A semiconductor device according to claim 65 wherein said columnar spacer comprises an insulating material.

68. A semiconductor device according to claim 65 wherein said semiconductor device is an active matrix type liquid crystal display device.

69. A semiconductor device according to claim 65 wherein said semiconductor device is at least one selected from the group consisting of a video camera, a digital camera, a projector, a goggle type display, a car navigation system, a personal computer, and a portable information terminal.